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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/813,532	03/21/2001	Srinath Hosur	TI-30812	3579
23494	7590	11/24/2004	EXAMINER	
TEXAS INSTRUMENTS INCORPORATED P O BOX 655474, M/S 3999 DALLAS, TX 75265			PATHAK, SUDHANSHU C	
			ART UNIT	PAPER NUMBER
			2634	

DATE MAILED: 11/24/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/813,532

Applicant(s)

HOSUR, SRINATH

Examiner

Sudhanshu C. Pathak

Art Unit

2634

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on August 17th, 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-12 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-12 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on August 17th, 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

1. Claims 1-to-12 are pending in the application.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1 & 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lee et al. (Antenna Diversity for an OFDM System in a Fading Channel, IEEE Military Communication Conference Proceeding, 1999, Pg. 1104-1109) in view of Dabak et al. (6,424,679).

Regarding to Claims 1 & 7, Lee discloses a method of transmission comprising transmitting a multiple sets of "N" symbols, where "N" is an integer greater than 1, on "N" subcarriers using a Orthogonal Frequency Division Multiplexing scheme (Abstract, lines 1-7, Pg. 1104 & Introduction, lines 1-31). However, Lee does not disclose providing "M-1" transformations of the set of "N" symbols, and transmitting the set of "N" symbols from the first antennas and transmitting the "M-1" transformations of set of "N" symbols on "N" subcarriers from a corresponding one of "M-1" antennas.

Dabak discloses a transmission method using Space Time Transit Diversity (STTD) in a spread spectrum communication system (Column 1, lines 15-67 & Column 3, lines 55-67). Dabak also discloses implementing antenna diversity in the

spread spectrum communications system (Column 1, lines 10-15 & Column 2, lines 6-30 & Fig. 2, elements 204, 206). Dabak further discloses providing transformations of the set of symbols and further transmitting each of the transformations of the symbols on subcarriers from corresponding antennas (Fig. 1 & Fig. 2 & Abstract, lines 1-10 & Column 3, lines 55-67 & Column 4, lines 1-35 & Claim 1 & Claims 6-to-8). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention that Dabak teaches implementing transforming the input symbols before transmitting the transformed symbols and the non-transformed symbols on respective antennas, and this can be implemented in the OFDM communication system as described in Lee so as to increase the diversity and BER performance of the communication system.

4. Claims 2-6 & 8-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lee et al. (Antenna Diversity for an OFDM System in a Fading Channel, IEEE Military Communication Conference Proceeding, 1999, Pg. 1104-1109) in view of Dabak et al. (6,424,679) in further view of Vasic (6,178,194).

Regarding to Claims 2, 5, 8 & 11, Lee in view of Dabak discloses an OFDM communication system of transmission comprising antenna diversity wherein transmitting transformed symbols and non-transformed symbols on multiple subcarriers via corresponding antennas as described above. However, Lee in view of Dabak does not specify the symbols transmitted to include both data and pilot symbols and further the number of symbols transmitted equals 64 of which 48 of the transmitted symbols are data symbols.

Vasic discloses a cellular mobile communication system wherein the known pilot symbols are inserted periodically and transmitted along with the data symbols such the symbols transmitted include both data and pilot symbols (Fig. 1 & Column 1, lines 5-67 & Column 3, lines 10-58 & Column 5, lines 40-67 & Column 8, lines 55-67 & Claim 9). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention that Vasic teaches inserting pilot symbols into the data symbol train and this can be implemented into the communication system as described in Lee in view of Dabak and this combined symbol train can be transformed as described in the system as described in Lee in view of Dabak so as to perform efficient carrier synchronization in the receiver. Furthermore, the burst size of the number of symbols and the mixture of the number and periodicity of pilot symbols inserted is a matter of design choice and there is no criticality in the mixture of pilot symbols and data symbols, in the symbol stream to be transmitted, wherein a pilot symbol is inserted after every three data symbols.

Regarding to Claims 3 & 9, Lee in view of Dabak in further view of Vasic discloses an OFDM communication system of transmission comprising antenna diversity wherein transmitting transformed symbols and non-transformed symbols on multiple subcarriers via corresponding antennas, and further the symbols transmitted include both data and pilot symbols as described above. Dabak further discloses providing two transformations, which includes pairwise rotation and complex conjugation of two of the set of symbols (Abstract, lines 1-10 & Fig. 1, 2 & Column 3, lines 55-67 & Column 4, lines 1-35 & Claims 5-7, 17). Therefore, it would have been

obvious to one of ordinary skill in the art at the time of the invention that Lee in view of Dabak in further view of Vasic satisfies the limitations of the claim.

Regarding to Claims 4 & 10, Lee in view of Dabak in further view of Vasic discloses an OFDM communication system of transmission comprising antenna diversity wherein transmitting transformed symbols and non-transformed symbols on multiple subcarriers via corresponding antennas, and further the symbols transmitted include both data and pilot symbols as described above. Vasic further discloses the symbols are to be QAM (Column 1, lines 55-67). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention that Lee in view of Dabak in further view of Vasic satisfies the limitations of the claim.

Regarding to Claims 6 & 12, Lee in view of Dabak in further view of Vasic discloses an OFDM communication system of transmission comprising antenna diversity wherein transmitting transformed symbols and non-transformed symbols on multiple subcarriers via corresponding antennas, and further the symbols transmitted include both data and pilot symbols and are QAM symbols as described above. Dabak further discloses the symbols to be transmitted are partitioned into pairs of symbols and the transformations are performed on the paired of the symbols and include pairwise rotation and complex conjugation of two of the set of symbols as a pair (Abstract, lines 1-10 & Fig. 1, 2 & Column 3, lines 55-67 & Column 4, lines 1-35 & Claims 5-7, 17). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention that Lee in view of Dabak in further view of Vasic satisfies the limitations of the claim.

Response to Arguments

5. Applicant's arguments filed on August 17th, 2004 have been fully considered but they are not persuasive. Regarding to Claims 1 & 7 Lee discloses an OFDM system comprising a receiver diversity antenna system i.e. multiple receiver antennas implemented in a wireless communication scheme. However, Lee does not specify a transmit diversity scheme i.e. multiple transmitter antennas implemented in the communication scheme. However, Dabak discloses a space time block coded transmit antenna diversity for a WCDMA (spread spectrum communication systems) multiple access communication system (Column 1, lines 15-67 & Column 2, lines 1-40). Dabak also discloses transmit diversity in a TDMA wireless communication system (Column 1, lines 15-67 & Column 2, lines 1-40). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention that Dabak teaches implementing Transmit diversity (STTD) on various different multiple access schemes in a wireless communications system, and this can also be implemented in the OFDM system as described in Lee so as to improve the performance of the communication system against fading, particularly at low Doppler rates, and increase the BER performance in a high fading environment. Furthermore, the Examiner relies upon Lee for the OFDM, which discloses receiver antenna diversity; this can also be considered transmitter diversity since the mobile station in a wireless communication system also transmits through the same antenna system, thus providing transmitter antenna diversity.

6. **The prior art made of record and not relied upon yet is considered pertinent to applicant's disclosure, it is recommended to the applicant to amend all the claims so as to be patentable over the cited prior art of record.** A

detailed list of pertinent references is included with this Office Action (See Attached "Notice of References Cited" (PTO-892)).

7. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.


Conclusion

8. **Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sudhanshu C. Pathak whose telephone number is (571)-272-3038. The examiner can normally be reached on M-F: 9am-6pm.**

- If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephen Chin can be reached on (571)-272-3056

- The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.
- Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Sudhanshu C. Pathak



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